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PATENT: 06076 USA

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLI-  
CATION OF : Goldstein et al.  
SERIAL NO. : 09/699,723 : GRP. ART UNIT: 1713  
FILED : October 30, 2000 : EXAMINER: Reddick, Marie L.  
FOR : REDUCED FORMALDEHYDE NONWOVEN BINDERS WHICH  
CONTAIN POLYMERIZED UNITS OF N-METHYLOLACRYLAMIDE

Assistant Commissioner for Patents  
Washington, D.C. 20231

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Sir:

**APPEAL BRIEF UNDER 37 CFR 1.192(b)**

This appeal is from the final rejection mailed on September 16, 2002.

**REAL PARTY IN INTEREST**

Air Products Polymers, L.P. is the real party in interest in the appeal. The assignment has been recorded at Reel/Frame 012762/0076.

**RELATED APPEALS AND INTERFERENCES**

There are no related appeals or interferences.

**STATUS OF CLAIMS**

Claims 1-7 are pending and are being appealed. Claims 1-7 were rejected in a final office action mailed on September 16, 2002, and an advisory action mailed on October 22, 2002.

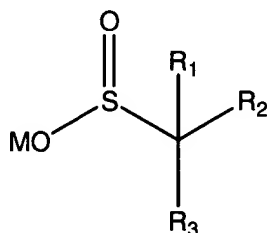
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### STATUS OF AMENDMENTS

In a response under 37 CFR 1.116, mailed on October 1, 2002, an amendment was made to Claim 4 to correct a chemical name. In the advisory action, the examiner indicated that the amendment would be entered for purposes of Appeal.

### SUMMARY OF INVENTION

The invention relates to use of a special class of reducing agents that is part of a redox catalyst system for the emulsion polymerization of vinyl acetate, N-methylolacrylamide (NMA), and, optionally, another monomer. The reducing agents have the formula



wherein M is a hydrogen atom, an ammonium atom or a monovalent metal ion, R<sub>1</sub> is OH or NR<sub>4</sub>R<sub>5</sub> wherein R<sub>4</sub> and R<sub>5</sub> each are H or C<sub>1</sub>-C<sub>6</sub> alkyl; R<sub>2</sub> is H or an alkyl, alkenyl, cycloalkyl or aryl and R<sub>3</sub> is CO<sub>2</sub>M. The preferred reducing agent is the glycolic acid adduct of sodium sulfite which is sold under the trademark Bruggolite FF-6. (page 6, lines 16-18, of the specification) One of the unexpected benefits of using these reducing agents as part of the redox catalyst system is that the polymer emulsion has reduced free formaldehyde content. (page 3, lines 1-14; and page 5, line 22 to page 6, line 18, of the specification)

### ISSUES

The issues presented in the final office action are as follows:

- 1) Objection to Claim 4 because of the following informalities: At line 6, of Claim 4, "and" should be inserted before "ethyl 2-hydroxy-2-sulfinato propionate-sodium salt".
- 2) Rejection of Claims 4 and 5 under 35 USC 112, second paragraph because:
  - A) The recited 2-hydroxy-2-sulfinato propionic acid was seen as being non-art recognized terminology.

B) The recited "catalytic system" per Claim 5 was seen as constituting indefinite subject matter as per the non-express establishment of proper antecedent basis.

3) Rejection of Claims 1-7 under 35 USC 103(a) as being unpatentable over Pinschmidt, Jr., et al.(US 4,360,632) or Weist et al. (US 4,044,197) in combination with Applicants' own disclosure; i.e., Applicants' disclosure that Bruggolite FF-6 is a known reducing agent.

### **GROUPING OF CLAIMS**

Claims 1 through 7 are to be considered as a group.

### **ARGUMENT**

#### **1) Objection to Claim 4**

The required amendment Claim 4 has been entered by the Examiner for purposes of appeal.

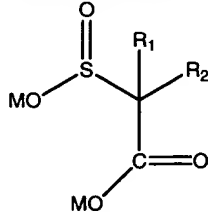
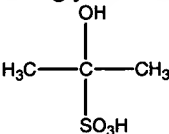
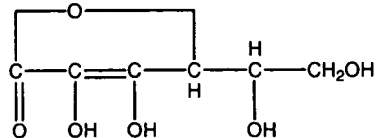
#### **2) Rejection of Claims 4 and 5 under 35 USC 112, second paragraph**

The required amendments have been entered by the Examiner for purposes of appeal.

#### **3) Rejection of Claims 1-7 under 35 USC 103(a)**

Claims 1-7 were rejected under 35 USC 103(a) as being unpatentable over Pinschmidt, Jr., et al.(US 4,360,632) or Weist et al. (US 4,044,197) in combination with Applicants' own disclosure; i.e., Applicants' disclosure that Bruggolite FF-6 is a known reducing agent. It was maintained by the Examiner, inter alia, that Pinschmidt, Jr. et al and Weist et al differ basically from the claimed invention as per the non-express recognition of the specifically depicted reducing agent; and the interchangeability of one well known reducing agent for another is a matter of ordinary choice to the skilled artisan. It was also maintained that Pinschmidt, Jr. et al. and Wiest et al were the closest prior art to the claimed invention. The undersigned disagrees with the Examiner's opinion regarding the closest prior art. It is believed that a careful review of Pinschmidt, Jr. et al, Wiest et al, and Mudge et al shows that Mudge et al is a closer reference than Pinschmidt, Jr. et al and Wiest et al.

Below is a table which summarizes the differences between the claimed invention and the three prior art references.

Claims/Reference	Monomers forming Polymer Emulsion	Reducing Agent
Claimed invention	Vinyl acetate, N-methylol acrylamide (NMA), and optionally other monomers	 <p>where M is a hydrogen atom, an ammonium atom or a monovalent metal ion, R<sub>1</sub> is OH or NR<sub>4</sub>R<sub>5</sub> wherein R<sub>4</sub> and R<sub>5</sub> each are H or C<sub>1</sub>-C<sub>6</sub> alkyl; R<sub>2</sub> is H or an alkyl, alkenyl, cycloalkyl or aryl and the like.</p>
Pinschmidt, Jr. et al	Vinyl monomer; one monomer system is vinyl acetate, ethylene and <u>optionally</u> a functional monomer such as an ether of NMA. NMA itself is not listed as a possible monomer and is not in any of the examples.	<p>ketone bisulfite; the ketone having 3-8 carbon atoms, such as acetone bisulfite and glyoxal bisulfite.</p>  <p>acetone bisulfite</p>
Wiest et al	Ethylene; vinyl acetate; a monomer having an N-methylol group, such as NMA; an acryl compound; a mono-olefinically-unsaturated carboxylic acid; and a poly-olefinically-unsaturated monomer having a Tg of -40 to +10 °C	<p>Examples of optional reducing agents (col. 5, lines 13-18): sodium formaldehyde sulfoxylate; iron-II salts; sodium dithionite; sodium hydrogen sulfite; sodium sulfite; and sodium thiosulfate.</p> <p>No reducing agent was used in examples 1-5; sodium formaldehyde-sulfoxylate was used in examples 6-9.</p>
Mudge et al	Vinyl acetate, NMA, and optionally other monomers	<p>ascorbic acid (structure below) and isomers thereof</p> 

Pinschmidt, Jr. et al teach a process for polymerizing a reaction mixture of vinyl monomer, stabilizer, oxidizing agent and reducing agent, wherein the reducing agent is a water-soluble ketone bisulfite. The reported value of the reducing agent is the fact that the reducing agent is free of formaldehyde yet permits control of the polymerization without

yellowing or odor problems (col. 2, lines 28-32). Representative vinyl monomers are listed at col. 2, lines 47-65 and vinyl acetate and ethylene are preferred. Examples of functional monomers that are optionally polymerized with vinyl acetate and ethylene are listed at lines 60-65 (col. 2) and include, for example, acrylic acid, glycidyl acrylate, crotonic acid, itaconic acid, maleic acid, and ethers of NMA such as N-n-butoxymethylacrylamide. NMA itself is not listed as an optional monomer nor is it or its ether used in the examples. It is agreed that Pinschmidt, Jr. et al discloses the use of ketone bisulfites. However, there is a significant difference between Applicants' claims and Pinschmidt, Jr. et al because a ketone bisulfite is not *prima facie* suggestive of the sulfinic acid derivatives having carboxyl ( $\text{CO}_2\text{M}$ ) functionality as required by the claims on appeal. It is respectfully submitted that the ketone ( $\text{C}=\text{O}$ ) is not equivalent nor suggestive of the  $\text{CO}_2\text{M}$  functionality. Although Pinschmidt Jr. et al discloses the production of formaldehyde free emulsions, there is no suggestion that the ketone bisulfite is more effective than other non formaldehyde reducing agents when emulsion polymerized in the presence of N-methylolacrylamide. Even if it were, it is respectfully submitted that it would have no bearing on the resolution under 35 U.S.C. §103(a), since there needs to be more of teaching of a chemical equivalence here to establish a *prima facie* case. It would not therefore have been obvious to combine the teachings of Pinschmidt, Jr. et al and Applicants' disclosure to obtain the claimed invention in which vinyl acetate is emulsion polymerized with NMA and optionally another monomer using a reducing agent as recited in Claim 1.

Wiest et al discloses vinyl acetate based polymers containing N-methylolacrylamide as the Examiner suggests. However, at col. 5, lines 5 to 18, examples of suitable polymerization catalysts include water-soluble free-radical-formers generally used in emulsion polymerization which can be used alone or together with a reducing agent such as sodium formaldehyde-sulfoxylate, iron II salts, sodium dithionite, and others. The reducing agent is not required and in fact is not used in Examples 1-5. Sodium formaldehyde-sulfoxylate is used in Examples 6-9. None of the possible reducing agents, including the reducing agent used in the examples, are suggestive of the reducing agent recited in Claims 1-7 of this invention. Applicants do not understand the basis for concluding this teaching is sufficient to establish a *prima facie* case of obviousness. It is submitted that it would not

have been obvious to combine the teachings of Wiest et al with Applicants' disclosure to obtain the claimed invention.

Mudge et al. teach use of a particular initiator system comprising a hydrophobic hydroperoxide and ascorbic acid (including isomers of ascorbic acid) in order to reduce the formaldehyde content in the preparation of an NMA crosslinked vinyl acetate-based emulsion polymer. Vinyl acetate can be copolymerized with at least one of any conventionally employed comonomer, such as ethylene, vinyl chloride, and vinyl esters of aliphatic carboxylic acids.

Based on the comparison discussed above and summarized in the table, it is submitted that Mudge et al. is a closer reference to the claimed invention compared to Pinschmidt, Jr. et al and Wiest et al. Mudge et al require the presence of a reducing agent (ascorbic acid or isomers of ascorbic acid such as isoascorbic acid) as part of a redox system in the emulsion polymerization reaction of vinyl acetate, NMA, and optionally another monomer. The use of the redox system is reported to result in polymer emulsions with lower levels of free formaldehyde compared to the same polymer emulsions prepared using other redox systems.

Data rebutting a prima facie obviousness rejection

In Example 2, page 8, line 20 to page 9, line 24, of the specification, Applicants compared the use of ascorbic acid to a representative compound of Claim 1 of this invention, i.e., the glycolic acid adduct of sodium sulfite sold under the trademark Bruggolite FF6, as a reducing agent for the emulsion polymerization of vinyl acetate, ethylene, and NMA. The results showed that Bruggolite FF6 was significantly more effective than ascorbic acid in reducing the free formaldehyde in the polymer emulsion. There is no teaching that would suggest such an unexpected and superior result. The other sulfites of the formula in Claim 1 are homologues or are related structurally to the Bruggolite FF-6 reducing agent. Absent a reference illustrating that homologues or structurally similar compounds would not offer similar results to the glycolic acid adduct of sodium sulfite, Applicants are entitled to the reasonable coverage afforded by the compositional structure in Claim 1. The results of

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Example 2 rebut a *prima facie* obviousness rejection based on the premise that reducing agents are interchangeable and a matter of ordinary choice for the skilled artisan.

Based on the above remarks, it is submitted that the claimed invention would not have been obvious based on the disclosure of Pinschmidt, Jr. et al or Wiest et al. in combination with Applicants' own disclosure and the rejection of Claims 1-7 under 35 USC 103(a) should be reversed.

Respectfully submitted,



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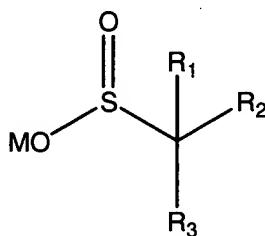


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APPENDIX  
CLAIMS ON APPEAL

1. In a vinyl acetate based polymer emulsion formed by the emulsion polymerization of vinyl acetate and N-methylolacrylamide, optionally other monomers, in the presence of a stabilizing system and a redox catalyst system comprised of an oxidizing agent and a reducing agent, the improvement for reducing formaldehyde emissions in the resulting vinyl acetate based polymer emulsion, which comprises:

forming said vinyl acetate based polymer emulsion utilizing as the reducing component of the redox catalyst system a reducing agent of the formula:



where M is a hydrogen atom, an ammonium atom or a monovalent metal ion, R<sub>1</sub> is OH or NR<sub>4</sub>R<sub>5</sub> wherein R<sub>4</sub> and R<sub>5</sub> each are H or C<sub>1</sub>-C<sub>6</sub> alkyl; R<sub>2</sub> is H or an alkyl, alkenyl, cycloalkyl or aryl and R<sub>3</sub> is CO<sub>2</sub>M.

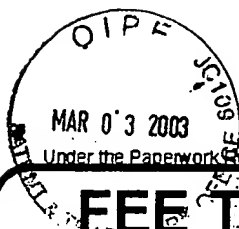
2. The vinyl acetate based polymer emulsion of Claim 1 in which the vinyl acetate based polymer comprises <sup>units of</sup> ethylene in an amount of from about 10 to 40% by weight of the polymer.

3. The vinyl acetate based polymer emulsion of Claim 2 wherein the N-methylolacrylamide is present in an amount of from about 0.5 to 10% by weight of the polymer.

4. The vinyl acetate based polymer emulsion of Claim 3 wherein the reducing agent represented by the formula is selected from the group consisting of: 2-hydroxyphenyl hydroxymethyl sulfinic acid-sodium salt; 4-methoxyphenyl hydroxymethyl sulfinic acid-sodium salt; 2-hydroxy-2-sulfinato acetic acid-disodium salt; 2-hydroxy-2-sulfinato acetic acid-zinc

salt; 2-hydroxy-2-sulfinato propionate-disodium salt; ethyl 2-hydroxy-2-sulfinato propionate-sodium salt.

5. The vinyl acetate based polymer emulsion of Claim 4 wherein the vinyl acetate based polymer emulsion is formed using a redox catalyst system of hydrophobic hydroperoxide and the glycolic acid adduct of sodium sulfite.
6. The vinyl acetate based polymer emulsion of Claim 3 wherein M is sodium or zinc.
7. The vinyl acetate based polymer emulsion of Claim 3 wherein R<sub>1</sub> is OH.



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Effective 01/01/2003: Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 320.00

## Complete if Known

Application Number	09/699,723
Filing Date	October 30, 2000
First Named Inventor	Goldstein, et al.
Examiner Name	Reddick, Marie L.
Art Unit	1713
Attorney Docket No.	06076 USA

## METHOD OF PAYMENT (check all that apply)

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01-0493

Air Products and Chemicals, Inc.

The Commissioner is authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments

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## FEE CALCULATION

### 1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 750	2001 375	Utility filing fee	
1002 330	2002 165	Design filing fee	
1003 520	2003 260	Plant filing fee	
1004 750	2004 375	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	

SUBTOTAL (1) (\$)

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X 18	
Multiple Dependent	-3** =	X 84	

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 84	2201 42	Independent claims in excess of 3
1203 280	2203 140	Multiple dependent claim, if not paid
1204 84	2204 42	** Reissue independent claims over original patent
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$)

\*\*or number previously paid, if greater. For Reissues, see above

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

Large Entity Small Entity

Fee Code (\$)	Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	2053 65	Non-English specification	
1812 2,520	1812 2,520	For filing a request for ex parte reexamination	
1804 920	1804 920	Requesting publication of SIR prior to Examiner action	
1805 1,840	1805 1,840	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 410	2252 205	Extension for reply within second month	
1253 930	2253 465	Extension for reply within third month	
1254 1,450	2254 725	Extension for reply within fourth month	
1255 1,970	2255 985	Extension for reply within fifth month	
1401 320	2401 160	Notice of Appeal	
1402 320	2402 160	Filing a brief in support of an appeal	320
1403 280	2403 140	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,300	2453 650	Petition to revive - unintentional	
1501 1,300	2501 650	Utility issue fee (or reissue)	
1502 470	2502 235	Design issue fee	
1503 630	2503 315	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 750	2809 375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 750	2810 375	For each additional invention to be examined (37 CFR 1.129(b))	
1801 750	2801 375	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

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SUBTOTAL (3) (\$) 320

## SUBMITTED BY

(Complete if applicable)

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Signature	Mary E. Bongiorno	Date	26 Feb 2003		

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